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COLUMBITE.[1]—A number of new crystals of this mineral from Standish, Maine, have been measured, and from the data thus obtained a recalculation of the axial ratio has been made. According to the new measurements, $a:b:c = .40234:1:.35798$ (Schrauf's position) and $.8285:1:.88976$ (Dana's position). The species is without doubt orthorhombic. Differences in composition appear to have little effect on the value of interfacial angles.

DIASPORE.[1]—The two new planes $P\check{\tfrac{4}{3}}$ and $P\check{2}$ were discovered on a fine crystal of diaspore from Chester, Mass.

SULPHUR.[1]—$\frac{1}{4}P$ and $\frac{3}{5}P^{\overline{3}}$ are described as new forms on sulphur from Rabbit Hollow, Nev.

——Among some remarkably fine crystals of *hiddenite*, *xenotime*, *monazite*, and *quartz* from North Carolina, Mr. Hidden[2] mentions having found on the latter a well-developed basal plane which yielded to Professor Des Cloizeaux, $OP \wedge R = 128°$, the calculated angle being 128° 13′. On black *tourmaline* from Sharpe's township, Alexander County, the new form $\frac{3}{5}R$ was detected. On *xenotime* from the same county $3P$ was found, and on *herderite* from Stoneham, Maine, the new plane $P\overline{\infty}$. A twinned crystal of *molybdenite* from Renfrew, Canada, suggests that this mineral may crystallize in the hexagonal system with its planes hemimorphically developed.

BOTANY.[3]

Pollen-Tubes of Lobelia.—In the AMERICAN NATURALIST, vol. xx. page 644, the pollen-tubes of *Lobelia syphilitica* were shown in the tissue of the style with enlarged or club-shaped tips. The hope was then expressed of germinating the pollen this summer, and determining the shape of the tubes when growing freely in the sugar solution. The *L. syphilitica* not being at hand, flowers of *L. cardinalis* were examined, and in every open flower the pollen within the tube made by the union of the anthers was found germinating in great abundance. The accompanying engraving shows a number of these pollen-tubes illustrating the various characteristic forms. The prevailing shape is like that of *L. syphilitica* as found penetrating the conductive tissue of the style. The nucleus of the pollen-grain is well brought out by acid azo-rubin, and in nearly all cases was found centrally located and varying from oblong to kidney-shaped. In only a few instances had the nucleus passed out of the pollen-grain. At *a* is shown a nucleus in an enlarged place in the tube near the tip. The three lower and right-hand grains are drawn as seen after the nucleus has taken the dye.

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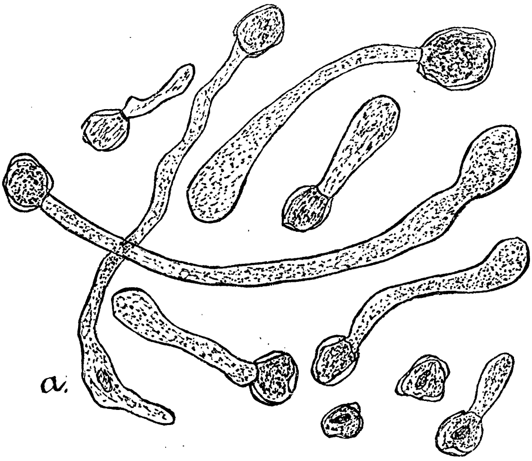
[1] Amer. Jour. Sci., xxxii., Nov. 1886, p. 386.

[2] Ib., xxxii., Sept. 1886, p. 204.

[3] Edited by Prof. CHARLES E. BESSEY, Lincoln, Nebraska.

It remains to be seen what the shapes of the pollen-tubes are in the *L. syphilitica* when growing free from the tissue of the style. Several flowers of *L. cardinalis* were examined before the corolla had opened, and in none were the pollen-grains germinating. A careful examination of the styles, ovaries, and ovules of flowers containing germinating pollen in the anther-tube but not yet having the stigmatic surface protruding beyond the anthers, and therefore unexposed, did not show any signs of fertilization. The pollen-tubes were often extending over the surface of the style, but they were not found penetrating its tissue.



Pollen-tubes of *Lobelia cardinalis.*

Less than half an inch of rain has fallen in this locality during the past eight weeks, and, therefore, these plants are passing through an unusual drought. There is a lack of vitality in these plants as a whole, and the flowers are apparently unable to fully perform their functions. The rosette of hairs on the style just below the stigma fails to carry up the pollen, partly because the hairs are feebly developed, and also because the stigma is not protruded to its usual length. The lobelia flower is admirably adapted for cross-fertilization, and we should not expect to find here a case of the closest kind impregnation, and yet there is sufficient suspicion to warrant further careful watching.—*B. D. Halsted, Botanical Lab. Agricul. Coll., Ames, Iowa.*

The Tree-Trunk and its Branches.—In order to determine quantitatively the general relations between the tree-trunk and its branches, the writer has in the past few years made three hundred observations on the white-oak, cottonwood, and other deciduous trees of the Northern States, and one hundred observations on the white pine in Tennessee. In each of these four hundred cases the circumference of the trunk[1] was carefully measured a few inches below the point of branching, and also the circumferences of the branches a few inches above the same point. The measurements were made a little above and below the crotch in order to avoid the extra swelling usually occurring at that point. In each instance the area of the trunk circumference was compared with the sum of the areas of the limb circumferences. In this way it was found that the limbs just above point of branching on the average contain eleven per cent. more wood than does the trunk just below the same point. This general fact may be somewhat interesting, but it is not very significant. In the economy of the tree, constantly strained and bent by the wind, strength is far more important than mere bulk. In order to determine the relative strength of the tree-stem and its branches, the cubes of the trunk circumferences were compared with the respective sums of the cubes of the corresponding limb circumferences.[2] This comparison showed that in ninety-five per cent. of the four hundred observed cases the trunk just below the crotch was stronger than all the limbs just above the same point. And on the average the trunk was found to be thirteen per cent. stronger than the sum of all its branches coming from one point. Now practically just above the crotch the branches have to support the same burden as does the trunk just below that point, then why is the trunk made stronger than its limbs? Well, even if a branch or several branches are broken by the wind, the tree can still grow and reproduce its kind, but if the trunk be broken the tree receives a much greater injury. Thus in general although the limbs of a tree are more bulky than the main stem, yet at practically the same elevations the trunk, by the constant action of the wind, is kept decidedly stronger than all its branches.—*B. F. Hoyt, Manchester, Iowa.*

The Article "Schizomycetes" in the Encyclopædia Britannica.—The twenty-first volume of the ninth edition of the "Encyclopædia Britannica" contains a valuable summary of our knowledge of the Schizomycetes, from the pen of H. Marshall Ward. In this discussion the writer considers the Bacteria only, evidently agreeing with many modern writers in considering the Yeast Fungi (Saccharomycetes) as having stronger affinities elsewhere than with the Bacteria. In a short historical introduction, it is stated that "Leeuwenhoek figured Bacteria as far back as the seventeenth century, and O. F. Müller knew several important forms in 1773, while Ehrenberg in 1830 had advanced to the commencement of a scientific separation and grouping of them, and in 1838 had proposed at least sixteen species, distributing them into four genera." Cohn's work (1853–1872) gave us the first really accurate knowledge of these organisms. He assumed the practical constancy of the forms met with, and accordingly described them as species and genera, taking *form* for his principal character. Later students of the Bacteria have shown that Cohn's species and genera often occur as phases in the life-history of a particular bacterium. What the specific limits are in many cases has not yet been determined. Zopf showed several years ago that "minute spherical cocci, short rodlets ('Bacteria'), longer rodlets ('Bacilli'), and filamentous forms ('Leptothrix'), as well as curved and spiral threads ('Vibrio,' 'Spirilum,' etc.), occur as vegetative stages in one and the same schizomycete."

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[1] Any relatively large part of the tree having branches was considered as a trunk, and several observations were frequently made among the larger limbs of the same tree.

[2] According to an established principle of mechanics, the strength of solid bodies of same form and substance is in proportion to the cubes of their like dimensions.

With these facts before us, it is at once evident that Cohn's classification breaks down entirely. No stable arrangement can be hoped for in the present state of our knowledge. Accordingly, a good deal of attention is now directed to the study of the various vegetative and reproductive states, including also the details as to their parasitic and saprophytic habits, and their deportment under cultivation. The chief vegetative forms are the following, viz.:

Cocci, spherical or spheroidal cells.

Rods or rodlets, slightly, or more considerably elongated cells.

Filaments, elongated cylindrical cells, united end to end in long threads.

Curved or spiral forms, rods or filaments more or less curved.

To these should be added the so-called zooglœa, or resting stage, in which the cell-walls swell up and form a gelatinous matrix. Spores are known to occur in most Bacteria, and these have been observed to germinate in several forms. Two principal types of spore formation are distinguished, viz.: 1, by the breaking up (fission) of the filament into its ultimate segments or joints (arthrospores); 2, by the formation of spores within the cell or filament (endospores).

The provisional outline of a classification of Bacteria given is a modification of De Bary's, as follows, viz.:

Group A. ASPOREÆ.

No spores distinct from the vegetative cells.

I. COCCACEÆ, including the genera, 1, *Micrococcus*; 2, *Sarcina*; 3, *Ascococcus*.

Group B. ARTHROSPOREÆ.

Spores produced by segmentation.

II. ARTHROBACTERIACEÆ, including, 4, *Bacterium*; 5, *Leuconostoc*; 6, *Spirochæte* (?).

III. Leptotricheæ, including, 7, *Crenothrix;* 8, *Beggiattoa;* 9, *Phragmidiothrix* (?); 10, *Leptothrix.*

IV. Cladotricheæ, including, 11, *Cladothrix.*

Group C. Endosporeæ.

Spores produced within the cells or filaments, including, 12, *Bacillus;* 13, *Vibrio* (?); 14, *Spirillum.*

In their relations to diseases the writer of the article unequivocally accepts the view that they are the cause, not the accompaniment. As to the mode of action he says, "If it [a bacterium] robs the blood or tissues of oxygen or of any other valuable constituent, or if its activity results in the excretion of poisonous substances, or in their formation as products of degradation of the matrix, or if it simply acts more or less as a mechanical obstruction or irritant,—in any of these cases harm may result to the delicately adjusted organism of the host." But "the living tissues of a healthy animal exert actions which are antagonistic to those of the parasitic invader; and it is now generally admitted that the mere admission of a Schizomycete into an animal does not necessarily cause disease. Were it otherwise, it would be difficult to see how the higher organisms would escape at all."

Botanical Journals.—The writer of this note has had during the past seventeen years, the period covered by his botanical teaching, many inquiries from beginners in botany as to what botanical journals it would be best for them to read. The replies have varied according to what appeared to be the individual needs of the inquirers. Recent inquiries from young botanists in widely-separated localities suggest the need of a short paper by way of guidance to those who would, if they could, read one or more botanical journals.

Nowadays, in any line of work, one who wishes to be progressive must read the proper journals. The young teacher who expects to keep up with the discoveries in his specialty without reading some of the journals devoted to that specialty will find himself in a few years hopelessly behind his reading fellow-workers. He must read, and he must read the best. He cannot afford to read anything less than the best. What shall he read? In answer to this it may be said that it is the duty of every teacher to so far hold his "specialty" in check that he shall be first and foremost a *botanist,* one who has knowledge of, and an interest in, all portions of the great science of plants. Let him be primarily a botanist, and then, if he has the inclination, secondarily a phanerogamist, a caricologist, a pteridologist, a bryologist, a lichenologist, a mycologist, an algologist, a phytotomist, or a vegetable physiologist, etc. The teacher may, and probably should be, a specialist, but he must be a botanist in the broadest sense first. His duty to his pupils is to instruct them in botany,—

the science of plants,—not in some narrow department of it. He must lay the foundation for *any* specialty, not for a particular one. Some of his pupils will become phanerogamists, some caricologists, some graminologists, some pteridologists, and so on, and he must be ready to guide them intelligently in their work. He must keep himself well informed in every department of the science.

There are three journals in the United States devoted entirely to botany. They occupy somewhat different fields, and accordingly have different values for different people. *The Botanical Gazette*, now eleven years old, is "devoted to all subjects which relate to botanical science." From the beginning the structural and physiological side of botany has been emphasized as much as possible, but the systematic botany of all the grand divisions of the vegetable kingdom has received due attention. From this journal the young botanist will obtain a very good idea of modern botany in all its departments. *The Bulletin of the Torrey Botanical Club* is the oldest of our botanical journals. For many years it was, as its name indicates, devoted mainly to local botany, being the organ of a botanical club in the city of New York. Systematic botany has always predominated in this journal, and its pages contain the descriptions of many new species. Since 1880 it has been given a wider range, and now includes papers on all botanical subjects, and is well adapted to help the young botanist. These are the best botanical journals for the teacher, with which the present writer is familiar in any country. There is nothing abroad which comes near to them in general helpfulness. *The Journal of Botany* (London) is practically confined to the systematic botany of the flowering plants and the pteridophytes, and for those teachers who are solely interested in this phase of the science this journal will be found very valuable. The *Botanische Zeitung* is almost entirely given over to the anatomical and physiological side of botany. *Flora* (Regensburg), with much the same tendency as the last, includes many papers on systematic botany.

Of special journals,—*i.e.*, those devoted to particular branches of the science,—we have one in the United States, viz., *The Journal of Mycology*, now two years old. As its name indicates, it is devoted exclusively to the botany of the fungi. Thus far special attention has been given to the description of new species and synopses of various families, with descriptions of the species. It is indispensable to the student of the fungi. The English journal, *Grevillea*, takes a wider range, aiming to be a "record of cryptogamic botany and its literature." Its articles are for the most part systematic, relatively few of them being structural or physiological. *Hedwigia* (Dresden) is much like *Grevillea* in plan and execution. A most valuable special periodical, of an entirely different character, is the *Journal of the Royal Microscop-*

ical Society, which contains (in addition to much other matter) summaries of current botanical researches, including the anatomy and physiology of phanerogams and cryptogams, and the systematic botany of the latter.—*Charles E. Bessey.*

ENTOMOLOGY.

Preliminary Descriptions of Ten New North American Myriapods.—The following new species are in the Museum of the Indiana University; they have been collected by different persons from various parts of the United States; those from Bloomington, Ind., being obtained by myself. The types of these will be deposited in the Smithsonian Institution.

1. *Lithobius howei* n. sp.—Brown; antennæ 20 jointed; ocelli 25–7; prosternal teeth 6; coxal pores 5, 5, 6, 5; spines of the first pair of feet 2, 3, 2; penultimate lost; last 1, 3, 3, 1; length 15 mm. *Hab.* Fort Snelling, Minn. (W. D. Howe.)

2. *Lithobius pullus* n. sp.—Brown; antennæ 20 jointed; ocelli 12–5; prosternal teeth 4; coxal pores 3, 4, 3, 3–2, 2, 2, 2; spines of the first pair of feet 1, 3, 2–1, 2, 1; penultimate 1, 3, 3, 2–1, 3, 3, 1; last 1, 3, 3, 1–1, 3, 3, 0; claw of the female genitalia tripartite; length 9–11 mm. *Hab.* Bloomington, Ind.

3. *Lithobius minnesotæ* n. sp.—Brown; antennæ 20 jointed; ocelli 13–6; prosternal teeth 4; coxal pores 4, 5, 5, 4; spines of the first pair of feet 1, 3, 2; penultimate 1, 3, 3, 1; last 1, 3, 2, 1; claw of the female genitalia tripartite; length 16 mm. *Hab.* Fort Snelling, Minn. (W. D. Howe.)

4. *Lithobius trilobus* n. sp.—Brown; antennæ 20 jointed; ocelli 22–8; prosternal teeth 4; coxal pores 3, 4, 4, 3–3, 4, 4, 4; spines of the first pair of feet 1, 3, 1; penultimate 1, 3, 2, 1–1, 3, 1, 0; last 1, 3, 1, 0; claw of the female genitalia tripartite; length 10–11 mm. *Hab.* Bloomington, Ind.

5. *Lithobius proridens* n. sp.—Yellow-brown; antennæ 24–29 jointed; ocelli 15–6; prosternal teeth 10–12; coxal pores 4, 6, 5, 5–3, 4, 4, 3; spines of the first pair of feet 3, 3, 2–2, 3, 1; penultimate 1, 3, 3, 2–1, 3, 3, 1; last 1, 3, 3, 2–1, 3, 3, 1; claw of the female genitalia whole; length 10–12 mm. *Hab.* Bloomington, Ind.

6. *Lithobius cardinalis* n. sp.—Brown; antennæ 20–31 jointed; ocelli 10–6; prosternal teeth 4; coxal pores 2, 4, 3, 2–2, 2, 3, 2; spines of the first pair of feet 2, 3, 2; penultimate 1, 3, 3, 1; last 1, 3, 3, 2–1, 3, 3, 1; claw of the female genitalia tripartite; length 6–9 mm. *Hab.* Bloomington, Ind.

7. *Scolioplanes ruber* n. sp.—Bright red; attenuated anteriorly and posteriorly; sternum cordiform; frontal plate present; prebasal plate concealed; ventral plates with a large, median foveola; pairs of feet in the male 67–69, female 71–73; length 53 mm. *Hab.* Bloomington, Ind.

8. *Iulus ellipticus* n. sp.—Resembles *I. impressus.* Vertex with